

CLAIMS

What Is Claimed is:

- 1 1. A cooking thermometer having an audible alarm, comprising:
2 a generally cylindrical housing assembly and a substantially hollow skewer
3 extending coaxially therefrom, said skewer having a proximal end contiguous to
4 said housing assembly and a sharpened distal end; said housing assembly further
5 including a temperature indicia plate, a pivoting pointer movable over said indicia
6 plate; a set temperature needle selectably manually positionable over said indicia
7 plate, and a tension wound spring-type audible alarm mechanism activated by
8 alignment of said set temperature needle and said pointer,
9 a linear segment of heat contractible shape memory alloy wire disposed
10 within said skewer and having a first end and a second end wherein said first end
11 is fastened to said distal end of said skewer, said shape memory alloy wire being
12 selected such that said wire begins phase transformation at a first lower
13 temperature M_s and completes phase transformation at a second higher
14 temperature A_F ;
15 a connecting wire having first and second ends wherein a lower portion of
16 said connecting wire is disposed within said skewer and an upper portion extends
17 into said cylindrical housing, said connecting wire having a first end secured to
18 said second end of said shape memory alloy wire;

19 a wire guide member positioned in said housing proximate said skewer
20 including a curvilinear passage therein adapted to allow sliding displacement of
21 said connecting wire therethrough, wherein said connecting wire extends
22 coaxially out of said skewer into said wire guide member and said second end of
23 said connecting wire extends out of said wire guide member in a direction
24 approximately normal to said skewer;

25 a gear assembly rotatably mounted in said housing wherein said second
26 end of said connecting wire is fixedly attached to said gear assembly whereby
27 sliding displacement of said connecting wire through said wire guide member
28 causes the rotation of said gear assembly, which rotation is transmitted to said
29 pointer through a cooperating gear train; and

30 a spring biasing means applied to said gear assembly constructed and
31 arranged to exert stress on said shape memory alloy wire via said gear assembly,
32 said spring biasing means having parameters which are configured to impart
33 desired phase transformation characteristics to said shape memory alloy wire
34 whereby optimization of said austenite/martensite phase transition and linearity of
35 temperature response are obtained.

1 2. The cooking thermometer of claim 1, wherein said spring biasing means
2 comprises at least one helical spring having a first end fixedly attached to said

3 gear assembly and a second end fixedly attached to at least one anchor member
4 positioned in said housing.

1 3. The cooking thermometer of claim 2, wherein said gear assembly includes
2 a sector gear having a plurality of teeth arranged on an arcuate outer edge and a
3 diametric projection extending therefrom, wherein said projection is adapted for
4 attachment to said second end of said connecting wire and said at least one helical
5 spring.

1 4. The cooking thermometer of claim 2, wherein the position of said at least
2 one anchor member in said cylindrical housing relative to said gear assembly is
3 selected to impart the desired tension characteristics to the helical spring whereby
4 a desired temperature range is achieved.

1 5. The cooking thermometer of claim 1, wherein M_s is approximately 140° F
2 and A_F is approximately 185° F.

1 6. The cooking thermometer of claim 1, wherein said shape memory alloy
2 wire is nickel titanium.

1 7. The cooking thermometer of claim 1, wherein said helical spring has a
2 spring constant of about 7.0 lb/in., a free length of about 0.38 in., a solid length of
3 about .096 in., and a load at solid length of about 1.7 lbs..

1 8. The cooking thermometer of claim 1, wherein said connecting wire is a
2 wire cable.

1 9. The cooking thermometer of claim 1, wherein said wire guide member
2 includes a cylindrical lower portion coaxially adjacent to said skewer having an
3 aperture extending axially therethrough and an upper portion having a curvilinear
4 channel contiguous to said aperture wherein said connecting wire slidingly
5 extends through said aperture and said curvilinear channel.

1 10. The cooking thermometer of claim 1, wherein said housing assembly
2 includes upper and lower portions rotatable with respect to one another, wherein
3 rotation of said upper portion with respect to said lower portion winds said alarm
4 mechanism.

1 11. The cooking thermometer of claim 7, wherein said housing assembly

2 further includes a rotatable central ring portion circumferentially disposed
3 between said upper and lower portions, said central ring portion linked with said
4 set needle to allow manual selection of a set temperature by rotation of the ring
5 portion.

1 12. A cooking thermometer, comprising:

2 a generally cylindrical housing assembly and a substantially hollow skewer
3 extending coaxially therefrom, said skewer having a proximal end contiguous to
4 said housing assembly and a sharpened distal end; said housing assembly further
5 including a temperature indicia plate, and a pivoting pointer movable over said
6 indicia plate;

7 a linear segment of heat contractible shape memory alloy wire disposed
8 within said skewer and having a first end and a second end wherein said first end
9 is fastened to said distal end of said skewer, said shape memory alloy wire being
10 selected such that said wire begins phase transformation at a first lower
11 temperature M_s and completes phase transformation at a second higher
12 temperature A_F ;

13 a connecting wire having first and second ends wherein a lower portion of
14 said connecting wire is disposed within said skewer and an upper portion extends
15 into said cylindrical housing, said connecting wire having a first end secured to

said second end of said shape memory alloy wire;

a wire guide member positioned in said housing proximate said skewer including a curvilinear passage therein adapted to allow sliding displacement of said connecting wire therethrough, wherein said connecting wire extends coaxially out of said skewer into said wire guide member and said second end of said connecting wire extends out of said wire guide member in a direction approximately normal to said skewer;

a gear assembly rotatably mounted in said housing wherein said second end of said connecting wire is fixedly attached to said gear assembly whereby sliding displacement of said connecting wire through said wire guide member causes the rotation of said gear assembly, which rotation is transmitted to said pointer through a cooperating gear train; and

a spring biasing means applied to said gear assembly constructed and arranged to exert stress on said shape memory alloy wire via said gear assembly, said spring biasing means having parameters which are configured to impart desired phase transformation characteristics to said shape memory alloy wire whereby optimization of said austenite/martensite phase transition and linearity of temperature response are obtained.

13. The cooking thermometer of claim 12, wherein said spring biasing means

comprises at least one helical spring having a first end fixedly attached to said gear assembly and a second end fixedly attached to at least one anchor member positioned in said housing.

14. The cooking thermometer of claim 13, wherein said gear assembly includes a sector gear having a plurality of teeth arranged on an arcuate outer edge and a diametric projection extending therefrom, wherein said projection is adapted for attachment to said second end of said connecting wire and said at least one helical spring.

15. The cooking thermometer of claim 13, wherein the position of said at least one anchor member in said cylindrical housing relative to said gear assembly is selected to impart the desired tension characteristics to the helical spring whereby a desired temperature range is achieved.

16. The cooking thermometer of claim 12, wherein M_s is approximately 140° F and A_F is approximately 185° F.

17. The cooking thermometer of claim 12, wherein said shape memory alloy wire is nickel titanium.

1 18. The cooking thermometer of claim 12, wherein said helical spring has a
2 spring constant of about 7.0 lb/in., a free length of about 0.38 in., a solid length of
3 about .096 in., and a load at solid length of about 1.7 lbs..

1 19. The cooking thermometer of claim 12, wherein said connecting wire is a
2 wire cable.

1 20. The cooking thermometer of claim 12, wherein said wire guide member
2 includes a cylindrical lower portion coaxially adjacent to said skewer having an
3 aperture extending axially therethrough and an upper portion having a curvilinear
4 channel contiguous to said aperture wherein said connecting wire slidingly
5 extends through said aperture and said curvilinear channel.